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Carbon metal and method of its manufacturing

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This invention relates to a method for treatment of metals and is particularly applicable to those metals used in the manufacturing of radio tubes and more specifically in the manufacturing of anode plates of such tubes and a number of other articles that can be made using this method. In these tubes, where an appreciable amount of heat is generated by the filament or cathode, the anode plate should be kept at a relatively low temperature, without this extraneous emission of electrons from the plate reduces the performance of the tube.

The anode plates are usually made of Nickel, the plate parts are usually made of a cold laminated strip. Cold laminated strips have a smooth and shiny surface and produce little heat radiation. In order to keep the anode plates manufactured from these strips at low temperatures desired for the tubes, it is necessary to improve their heat radiating properties. It was attempted to accomplish this by covering the surface of Nickel by carbon particles whish usually achieved by subjecting the Nickel to a carbon atmosphere in an electrically heated furnace. This atmosphere consisted of an appropriate gas with high carbon content such as butane. Until now, it was proposed to carry out this operation of coating the surface of the plates with carbon after their manufacturing. In order to obtain maximum adherence of the carbon particles to the surface of the plates, it was necessary to leave then in the furnace for extended periods of time until a thick

enough coating is formed. The particles immediately next to the surface of the plate do effectively adhere but those on the outside remain loose and should be removed by individual buffing of the parts. Because of the irregularity of the surfaces this method is tedious and time consuming and presents risks of deforming the plates.

In order to overcome these disadvantages, it was proposes to do the coating while the Nickel is still in strip form. This strip is then continually fed to the furnace where the coating takes place. Even though the latter method could be done somewhat rapidly, it did not give satisfactory results. One of the difficulties of this method is the carbon particles do not have enough adhesion to the surface of the strip and a number of them fall during the cutting or lamination of the strip.

With these two old methods one achieves a more or less black carbon nickel surface that is shiny but far from a perfect heat radiator. Furthermore one finds that the particles seem to come off he surface when vacuum is pulled on the tube. During this operation the tube is heated to eliminate all the gases that adhere to the glass and metal surfaces. A high frequency induction coil is then lowered around the tube making the metallic surfaces incandescent. Because of the fact that the carbon plates made using the old methods described earlier are not perfect heat radiators, they become so hot that an appreciable portion of the carbon deposit combines with the gases and is sucked out of the tube during vacuum pumping.

One of the goals of the present invention is to devise a method to produce a carbon coating on the Nickel having a rough or rugged surface using a sand blast or any other appropriate method. The nickel, having the surface treated in this manner is then carbon treated. But instead of trying to deposit a thick coating of carbon it is preferable to deposit only a thin coating of carbon. We found that this thin coating adheres very well to the entire rough surface of Nickel and consequently buffing was no longer needed. Furthermore, instead of having shiny and polished surfaces, as in the case of the old methods, the coating or deposit presents a black and mat aspect making the Nickel an efficient heat radiator. The heat radiating qualities of the anode plates, carbon treated according to the improved method described by the invention, make then escape to the overheating during incandescence of the tubes and the good adhesion of the carbon deposit to the surfaces stops the loss of carbon during vacuum.

The Nickel is treated with this method to make it rough or textured and to accomplish the carbon deposit while it is still in the form of a strip, because we found that the adhesion of the carbon to the surface is so good that it is practically unaffected by the bending or compression during processing of the plate parts.

According to a preferred mode of practice of this improved method, the Nickel strip is first subjected to a sand jet or a similar operation that roughens the surface and destroys the smooth shiny finish then the strip is carried through an electrically heated furnace inside of which an appropriate carbon atmosphere is maintained. If one desires, the unpolished strip can be subjected to an oxidizing treatment before carbon coating. After carbon treating the strip, it can then be cut into pieces which then can be laminated or compressed to form anode plates or other parts.

In reference to the attached drawing: Figure 1 is a side view of a radio tube having an anode plate made of Nickel according to the improved method of the invention. Figure 2 is a plane view of a cold laminated Nickel strip whose surface was treated according to the described method.
Figure 3 is a view in perspective of an anode plate cut and formed from the strip.

The tube represented in figure 1 of the attached drawings, is equipped with the usual bulb 2, a glass base 4, anode plate 6 and conductor supports 7. The plate parts are generally made of cold laminated Nickel strip having a thickness of 0.125 mm (0.005 inch) and a width corresponding to the height of the plates.

According to the preferred mode of practice of the invention, before forming the anode plates, the surface of the Nickel strip is finely roughed or textured in order to reduce the smooth and shiny finish. This roughening could be achieved, during the time the strip is fed from a roll, using a fine sand jet or gravel such as the one that can pass through a mesh of 18 holes per square centimeter or 120 holes per square inch.

The unpolished strip is then carried through a furnace conveniently heated inside of which an appropriate carbon atmosphere is maintained. This atmosphere consists of an appropriate gas with elevated carbon content such as butane. The effect of heat on the gas causes the deposit of carbon on the Nickel.

The travel of the strip in the furnace hat serves the purpose of depositing the carbon coating, is carried out preferably at a speed such that only a thin coating of carbon

is deposited on the nickel. The strip, without any other treatment, can then be cut into pieces and the latter compressed in order to form plates.

We have found that, the anode plates formed according to this improved method have a mat and very black finish, are perfect heat radiators, that the this uniformly thin carbon layer adheres firmly to the unpolished surface and that this layer is practically unaltered during the bending or compression of the pieces and that because of the very good adhesion of the carbon deposit and the heat radiation quality of the plates there is no danger of carbon particles being freed during the vacuum of the tube. The heat radiating qualities of the plates enable them to be maintained at the desired low temperatures during the functioning of the tubes and that there is no danger of short circuit inside the tube caused by detached particles. It thus obvious that this improved method could be reduced to practice economically and rapidly.

Of course the invention is not limited to the example described herein and can be applied in some different manner.

Summary of the invention

The present invention relates to:

1- A method for the treatment of metal used in the manufacturing of radio tubes in particular in the manufacturing of anode plates for these tubes. The method consists of roughening the surface of the metal in order to destroy its smooth and shiny appearance using for instance a jet of fine sand then subjecting the strip of metal, thus unpolished, to a treatment in order to produce a thin carbon coating with strong adhesion.

2- Novel industrial products, metal strips and radio anode plates resulting from the application of this method with roughened surfaces.

Fig. 1.

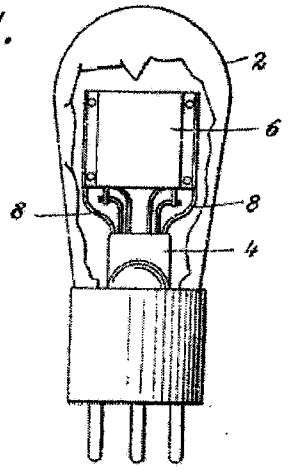

Fig. 2.

Fig. 3.